MY GARBAGE

Lesson 3
My Landfill is Sanitary
Landfill

Support Document

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Preparing materials for making the landfill.

Materials Needed

14	2L plastic soda bottles Remove the labels.
1	Scissors or X-Acto knife
1	Pair nylon hose
1	Marker
14	Cotton balls
7	Cups shredded paper
7	Cups small aquarium gravel
7	5in X .5in diameter circle of modeling clay
7	5in diameter circle of plastic trash bag
7	5in diameter circle of geotextile fabric
7	Plastic straws
14	Cups soil
7	Rubber bands
7	Cups water
1	Measuring cup
7	Reusable grocery bags
70	One gallon Zip-Lock bags
1	Roll paper towels

For a class size of 30, prepare kits for 7 landfill columns.

The class will be divided into 6 groups of 5.

The 7th landfill will be made by the teacher (as a demonstration).

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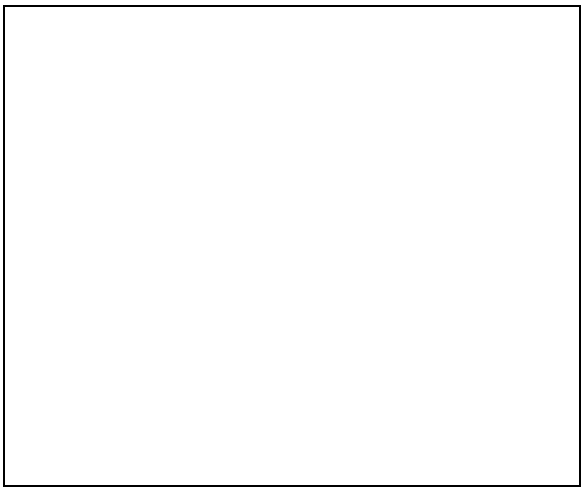
Preparing the plastic soda bottles for the landfill model

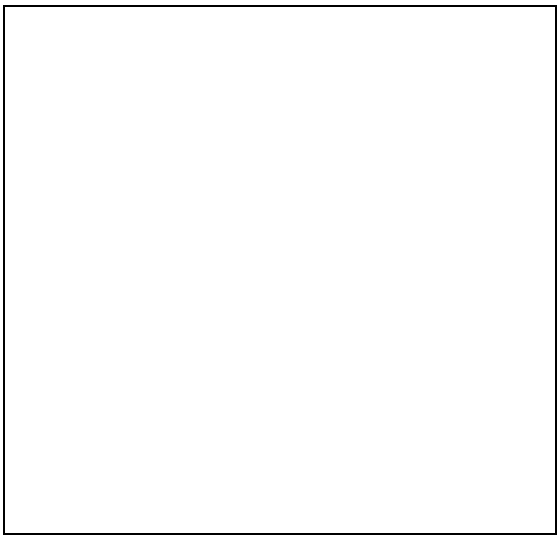
Pre-class Prep:

Bottle #1 Prep

1. Mark just below the taper where the bottom cut will be made.



2. Use the scissors or X-Acto knife to cut the bottom off of the first bottle.
3. Write #1 on the finished product.



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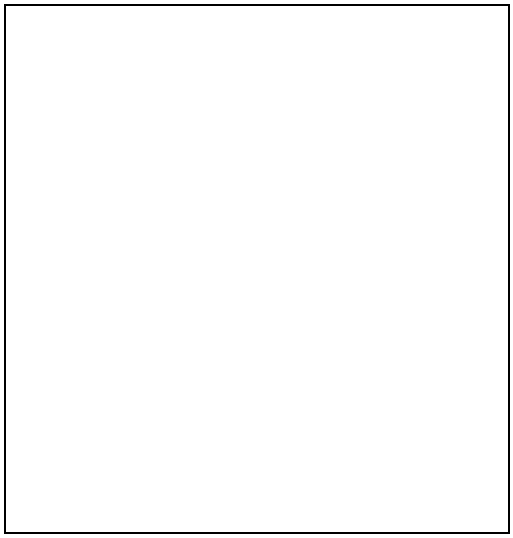
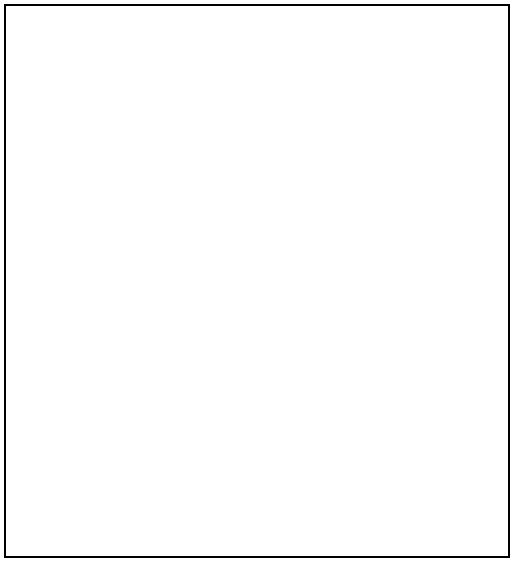
Bottle #2 Prep

4. Mark slightly above the midpoint where the bottom cut will be made.



5. With the scissors or X-Acto knife, cut the bottom off.
6. Write #2 on the finished product.



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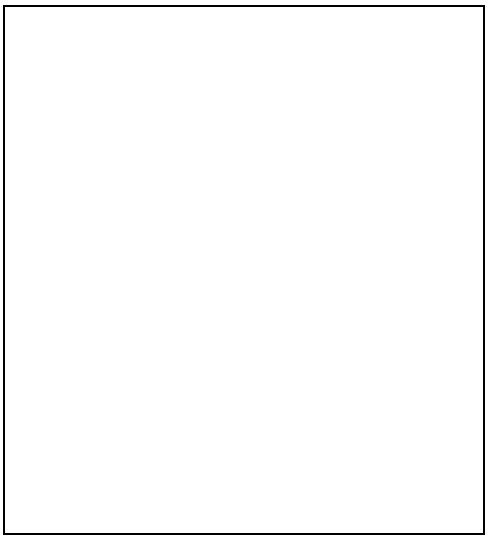
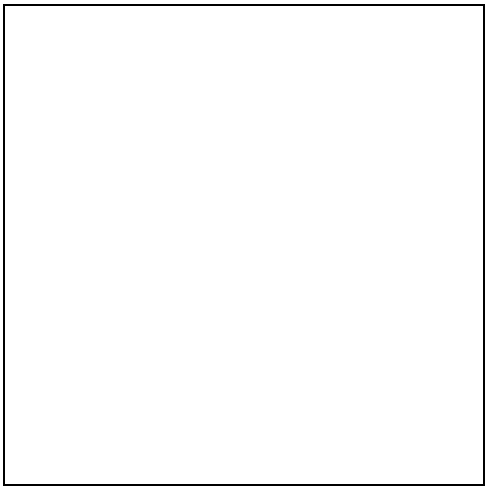
7. Cut the nylon hose into 2” squares.



8. Place 2 cotton balls into the neck of bottle #2.
9. Using the rubber bands, attach the nylon squares to the neck of bottle #2.



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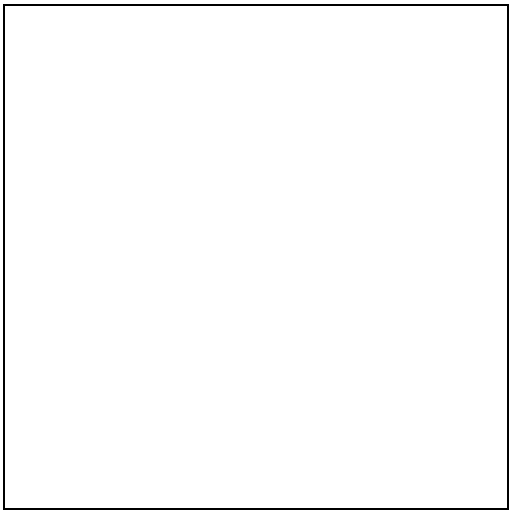
10. Assemble the two plastic bottles into the shape of a column.



Prepare the contents of the landfill column

11. Measure 1 cup of shredded paper into each of 7 Zip-Lock bags.
12. Measure 1 cup of aquarium gravel into each of 7 Zip-Lock bags.
13. Place 1 plastic straw into each of 7 Zip-Lock bags.

14. Measure 1 cup of water into each of 7 Zip-Lock bags.
15. Measure 1 cup of soil into each of 14 Zip-Lock bags.

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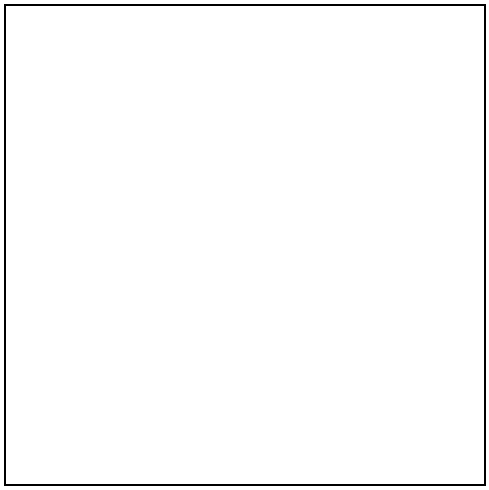
16. Slice a piece of modeling clay from the large block of clay.
17. Mold the clay into a disk with a diameter approximately equal to the diameter of the 2L plastic soda bottle, approximately ½ in. thick.

18. Fully moisten a paper towel.
19. Wrap the clay disk with the moist paper towel.

20. Place the clay disk into a zip-lock bag.



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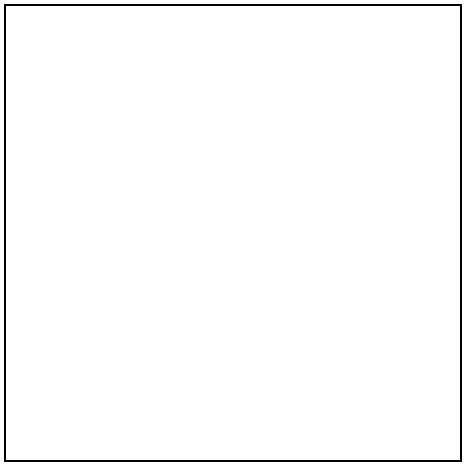
21. Place a piece of discarded 2L soda bottle on the geotextile fabric.
22. Using a marker, trace the outline of the diameter of the soda bottle onto the geotextile fabric.

23. Cut the geotextile fabric into circles.
24. Place the geotextile fabric circle into a zip-lock bag.

Note: The purpose of geotextile fabric is to allow moisture to pass through, while filtering out dirt or soil. Any type of fabric meeting these criteria will work for this model.

Recommendation: sun shade fabric used for patio shade structures..



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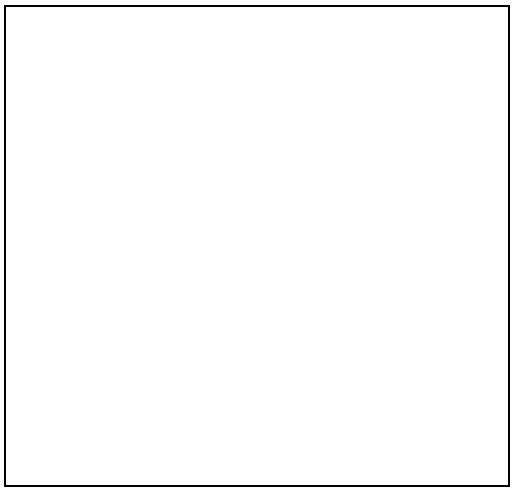
25. Place a piece of discarded 2L soda bottle on a plastic trash bag.
26. Using a marker, trace the outline of the diameter of the soda bottle onto the plastic trash bag.

27. Cut the plastic trash bag into circles.
28. Place the plastic trash bag circle into a zip-lock bag.



14. Prepare the landfill model kits in reusable grocery bags by placing the following items in each one:

- 1 Landfill column
- 1 Bag of shredded paper
- 1 Bag of water
- 2 Bags of soil
- 1 Bag of aquarium gravel
- 1 Bag containing plastic circle
- 1 Bag containing modeling clay disk
- 1 Bag containing geotextile circle
- 1 Bag containing plastic drinking straw
- 1 Bag containing plastic circle

Teaching Strategies

My Landfill is Sanitary

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Teaching Strategies

Lecture

This strategy is effective for all levels of learners.

During the lecture, an alternative may be to use the overhead (use student worksheet as a transparency)

Worksheets

Worksheets are provided to guide the students through the lesson. The lead teacher may prefer the students to take their own notes.

For below level learners and special ed, the teacher may consider having the worksheets filled out for these students. This would be done before class by the teacher or by having an advanced student help.

Group Makeup

Groups should be selected by the lead classroom teacher. The groups should be heterogeneous and learners of all levels should be included.

Group Discovery

The group work is effective for all levels of learners

Homework questions

Most elementary classrooms have a computer class scheduled as a "special". If you provide the Recycle City link to the computer teacher, class time may be allotted for internet use.

Handouts of printed copies of the Recycle City information contain the same information as the website. If internet use is not available, please use the printouts.

Tip: The student worksheet can be made as a transparency for group discussion.

Lesson Time:
15 minutes

My Landfill is Sanitary Homework Review

Geotextile Fabric

This specially designed fabric allows moisture to pass through while filtering out soil. It allows leachate that may filter through the soil layer to reach the gravel layer. Piping within the gravel layer then pumps and removes the leachate for treatment.

Objective

Students will understand how the homework relates to landfill structure.

Materials Needed

30	Single subject notebooks
6	Dry erase markers
1	White board
1	Homework key

Anticipatory Set

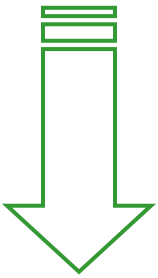
Write the lesson objectives on the white board. Discuss with the students what the objectives of the lessons are.

Objective: You will make a connection between class discussion and homework.

Distribute handouts (or workbooks).

Introduction:

"Please take out your homework so we can begin discussing it."



Modeling / Guided Practice

1. Have the students take out their student workbook (or handout).
2. Read the homework questions.
3. Have the students answer the questions.
4. Discuss the answers to the homework.
5. Ask the students to relate how the homework relates to the last lesson.

Closure:

1. Ask if the students are making the connection between the landfill that was made last time and the new style they saw at Recycle City.

Independent Practice

1. Not applicable. Transition into part 2 of the lesson.

Lesson Time:
30 minutes

Vocabulary

Landfill liner

Geotextile fabric

Sanitary landfill

My Landfill is Sanitary

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Apex Regional Landfill

Apex Regional Landfill is Nevada's largest landfill. It is located just north of the city of Las Vegas in Clark County.

Objective

Students will understand the basic structure of a sanitary landfill.
Students will understand the difference between the old style landfill and the sanitary landfill.

Materials Needed

30	Single subject notebooks (student's)
6	Dry erase markers
1	White board
7	Prepackaged reusable grocery bags containing landfill model kits.

Anticipatory Set

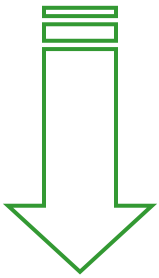
Write the lesson objectives on the white board.
Discuss with the students what the objectives of the lessons are.

Objective: You will understand the basic structure of a landfill.

Objective: You will construct a model landfill.

Introduction:

"So, we discussed last time the structure of the old-style landfill. From the homework you were introduced to the sanitary landfill. Let us now build a model of the sanitary landfill."



Modeling / Guided Practice

1. On the white board, draw the layers of the landfill (see support materials)
2. Have the students copy a drawing of the model in their notebook.

3. Have the students assemble into their preselected groups of 5.
4. Pass out the landfill kits in prefilled reusable grocery bags.

Assemble the model landfill

5. Assemble the bottom of bottle #1 with the top of bottle #2 to form the structure of the landfill. This is to show the students how the model will fit together. Take care not to shove them together too tightly.
6. Add 1 cup of soil to the model to represent the ground.
7. Have the students do the same.

8. Add the modeling clay disk to the model. When doing this, be sure to press the clay to the sides of the bottle to form a seal. (This will be important later.)
9. Have the students do the same.

8. Add the precut plastic circle to form the liner.
9. Have the students do the same.

10. Add the aquarium gravel.
11. Have the students do the same.
12. Add the plastic drinking straw to the model. Explain that pipes are included in this layer for collection and treatment of leachate.
13. Have the students do the same.

14. Add the precut circle of the material representing the geotextile fabric.
15. Have the students do the same.

16. Add a layer of soil to the model.
17. Have the students do the same.

18. Compare the anatomies of the two types of landfills up to this point.

Modeling / Guided Practice

19. Add shredded paper to the model to represent the MSW.
20. Have the students do the same.

21. Add a final layer of soil to the model to represent the daily cover.
22. Have the students do the same.

23. Discuss the reasons for daily cover.

24. Using the measuring cup, pour water into the landfill model.
25. Have the students do the same.

26. Ask the students if the water is flowing through their landfills.

27. Connect leachate with the flow of water through the landfill.

Closure:

1. Ask if the students understand how the landfill was made.
2. Ask if they understood the purpose of the lesson.

Independent Practice

1. Not applicable for this lesson.

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VOCABULARY

My Landfill is Sanitary

Landfill

Vocabulary

Landfill Liner: A system of physical barriers in a landfill designed to prevent toxic leachate from reaching the groundwater.

Geotextile Fabric: A fabric used within a liner system to prevent large particles of soil and municipal solid waste from entering the leachate recovery system. The

Sanitary Landfill: A landfill that has a liner system.

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My Landfill is Sanitary

Landfill

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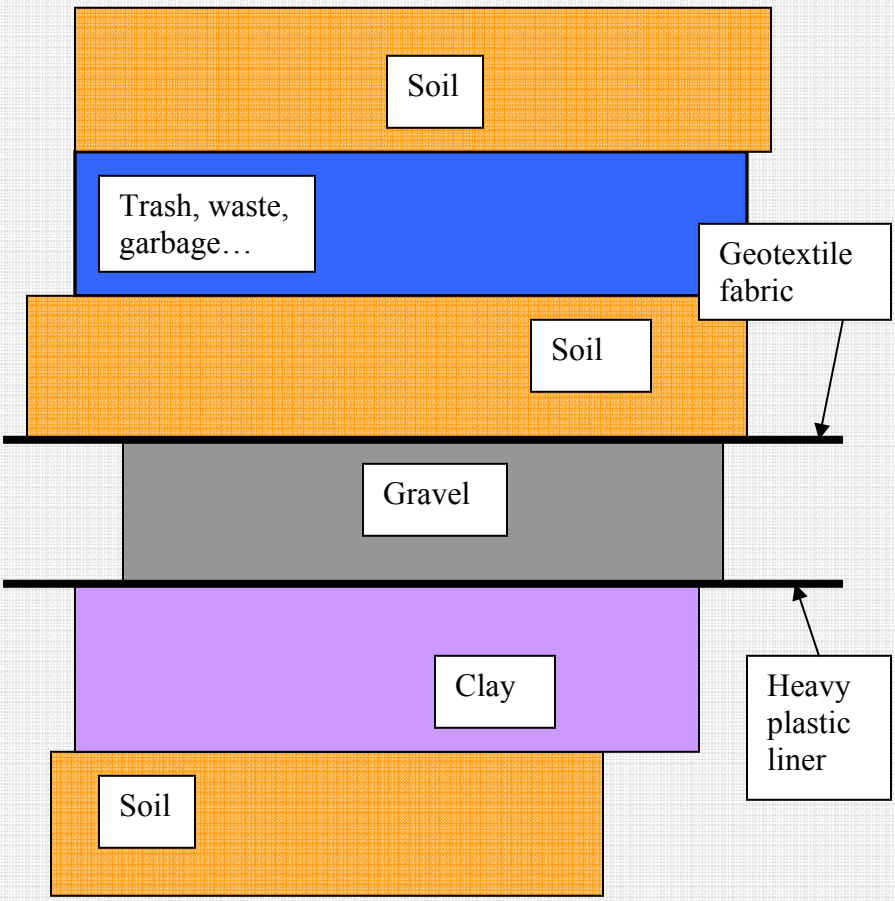
Layers of Sanitary Landfills



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My Landfill is Sanitary

Landfill

Reasons for daily cover:

Fire Control

Odor control

Vector control

Daily cover consists of 6 inches of dirt.

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Landfill

Issues concerning water flow through a sanitary landfill:

By pouring the water into this landfill model, we are showing the concept of leachate recovery.

****In a Sanitary Landfill, the liner structure is designed to trap leachate and prevent it from seeping into the groundwater. In the model, the clay disk should prevent the water from flowing through the landfill.**

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My Landfill is Sanitary

Landfill

Comparing the anatomies of the two landfill styles:

Please refer to the diagrams in lesson 2 and 3 for visual representations.

Old Style landfill:
EARTH, TRASH, EARTH, TRASH, EARTH, etc.

Sanitary landfill:
EARTH, CLAY, PLASTIC LINER, GRAVEL, GEOTEXTILE FABRIC, EARTH, TRASH, EARTH, etc.

Please refer to the homework key for the benefits of sanitary landfills:

8. Which landfill is better for the environment? Why?
Answer: The New Landfill is better for the environment. The structure calls for plastic liners that keep the hazardous materials from seeping into the groundwater. The liners also keep the leachate from entering the groundwater that may be used for human consumption. The sanitary landfill also contains less waste because reusable and recyclable materials have been removed.

Solid Waste and Recycling Curriculum **Name:**_____

Lesson 3

My Landfill is Sanitary **Date:**_____

Objectives:	I will understand the basic structure of a sanitary landfill. I will understand the structural difference between the old style and the sanitary landfill.

Vocabulary:

Landfill Liner:

Geotextile Fabric:

Sanitary Landfill:

Please draw the structure of a sanitary landfill:

Solid Waste and Recycling Curriculum **Name:**_____

Lesson 3

My Landfill is Sanitary **Date:**_____

Sanitary Landfill:

What are the benefits of using a sanitary landfill?

_____

What are your general thoughts on the differences between the sanitary landfill and the old style landfill?

_____

Why is it important to prevent leachate from getting into the groundwater?